



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND  
INTERFERENCES

In re the Application of

Takanori SHIMIZU et al.

Application No.: 10/524,686

Examiner: T. SOLOLA

Filed: April 19, 2005

Docket No.: 122760

For: PROCESS FOR PRODUCING AMINOBENZOPYRAN COMPOUND

BRIEF ON APPEAL

Appeal from Group 1625  
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I. **REAL PARTY IN INTEREST**

The real party in interest for this appeal and the present application is Nissan Chemical Industries, Ltd., by way of an Assignment recorded in the U.S. Patent and Trademark Office at Reel 016543, Frame 0308.

**II. STATEMENT OF RELATED CASES**

There are no prior or pending appeals, interferences or judicial proceedings, known to any inventor, any attorney or agent who prepared or prosecuted this application or any other person who was substantively involved in the preparation or prosecution of this application, that may be related to, or that will directly affect or be directly affected by or have a bearing upon, the Board's decision in the pending appeal.

### **III. JURISDICTIONAL STATEMENT**

The Board has jurisdiction under 35 U.S.C. §134(a). The Examiner mailed a Final Rejection on August 4, 2009, setting a three-month shortened statutory period for response. The time for responding to the Final Rejection expired on November 4, 2009. Rule 134. Both the Notice of Appeal and the Appeal Brief were filed on November 4, 2009. The time for filing an Appeal Brief expires the later of two months from the filing of the Notice of Appeal, or one month from the mailing date of the Notice of Panel Decision if a Pre-Appeal Brief Request for Review is sought. Bd.R. 41.37(c) and Official Gazette Notice, July 12, 2005. Therefore, this Appeal Brief is timely filed.

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**VI.            STATUS OF AMENDMENTS**

No amendments were made after the Final Rejection dated  
August 4, 2009.

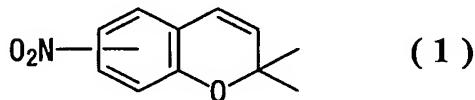
**VII. GROUNDS OF REJECTION TO BE REVIEWED**

The following grounds of rejection are presented for review:

Claims 1, 2, 4, 5, 7, and 9 are rejected as having been obvious under 35 U.S.C. §103(a) over Hiroko Ishihara et al. (JP Publication No. 05-078289, hereinafter "Ishihara"). The Final Rejection dated August 4, 2009 refers to this publication as "Hiroko," which is the first name of the first author of the cited publication. However, Appellants will refer to the surname ("Ishihara") of the first author of the cited publication, when discussing this publication.

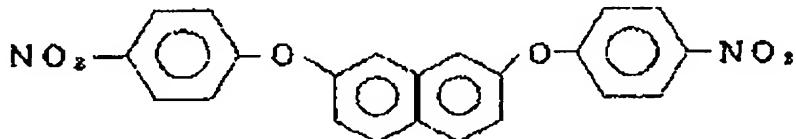
## VIII. STATEMENT OF FACTS

1. The Examiner rejects claims 1, 2, 4, 5, 7, and 9 under 35 U.S.C. §103.  
*See page 2 of the Final Rejection dated August 4, 2009.*
2. In the Final Rejection, the Examiner cites only paragraph [0017] of the computer-generated translation of Ishihara. *See page 2 of the Final Rejection dated August 4, 2009.*
3. Claim 1 recites "reducing a nitro group on 2,2-dimethyl 2H-1-benzopyran compound of formula (1)



with hydrazine in the presence of platinum or palladium as a metal catalyst." *See Claim 1.*

4. Ishihara discloses a hydrazine reduction reaction of 2,7-Bis-(4-nitro phenoxy) naphthalene:



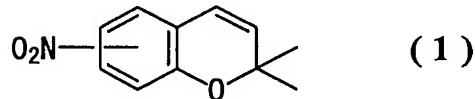
*See paragraph [0009] and [0017] of the computer-generated translation of Ishihara.*

5. There is nothing in Ishihara that discloses the 2-dimethyl 2H-1-benzopyran starting material recited in claim 1. *See paragraphs [0007]-[0009] of the computer-generated translation of Ishihara.*

6. The Examiner asserts that 2,7-Bis-(4-nitrophenoxy) naphthalene



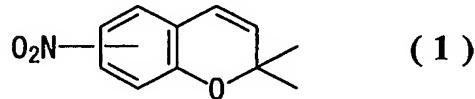
is "analogous" to the 2,2-dimethyl 2H-1-benzopyran compound of formula (1) in claim 1



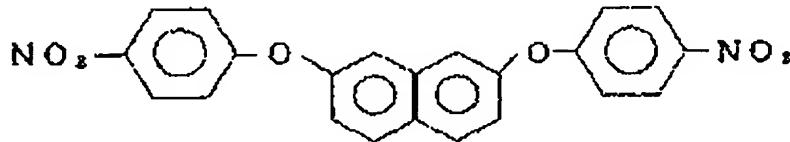
*See page 3 of the Final Rejection dated August 4, 2009.*

7. Appellants disagree.

8. The 2,2-dimethyl 2H-1-benzopyran compound of formula (1) in claim 1



and 2,7-Bis-(4-nitrophenoxy) naphthalene in Ishihara



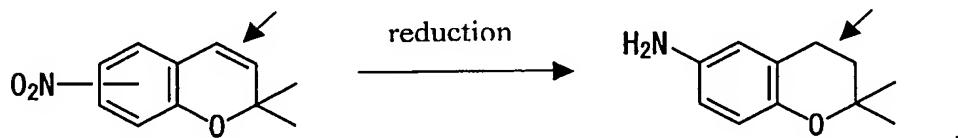
are structurally distinct and non-analogous.

9. 2,7-Bis-(4-nitrophenoxy) naphthalene (disclosed in Ishihara) does not have an olefin bond. *See Fact 4.*

10. The 2,2-dimethyl 2H-1-benzopyran compound of formula (1) in claim 1 has an olefin bond in the right-hand ring as depicted in Fact 3. *See Fact 3.*

11. The Examiner asserts that "[t]here is no evidence in the specification or the prior arts [sic] that any part of the starting reagents other than NO<sub>2</sub> is involved in the reaction process." *See* page 3, lines 7-9, of the Final Rejection dated August 4, 2009.
12. Appellants disagree.
13. Benzopyran compounds, such as the 2,2-dimethyl 2H-1-benzopyran compound of formula (1) of claim 1, are widely known in the art as easily undergoing reduction at the olefin bond. *See* paragraphs [0002], [0003] and [0046] of the present specification.
14. It is well known in the art that the aromatic double bonds in the benzene rings of benzopyrans are more stable than olefin bonds in benzopyrans. *See* paragraphs [0002] and [0003] of the present specification, in which reactivity of the olefin bonds, but not the reactivity of the aromatic rings, is addressed.
15. One skilled in the art would expect a reduction of a benzopyran with an olefin bond to produce a significant yield of product in which the olefin bond in the benzopyran starting material was reduced. *See* Facts 13 and 14; and paragraphs [0002] and [0003] of the present specification.

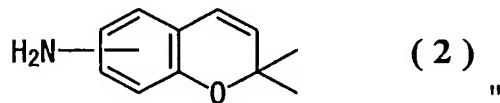
16. The presence of an olefin bond in the starting reagent (2,2-dimethyl 2H-1-benzopyran) can result in an undesired by-product of the reduction reaction, in which the olefin bond is also reduced:



*See* by-product (5) on page 8 and Tables 1 and 2 on pages 8 and 10 of the present specification.

17. One skilled in the art would not expect that a reduction of a benzopyran with an olefin bond would produce a high yield of product in which the olefin bond in the benzopyran starting material was not reduced. *See* Facts 13 and 14; and paragraphs [0002] and [0003] of the present specification.

18. Claim 1 recites a "method for producing aminobenzopyran compound of formula (2)



*See* Claim 1.

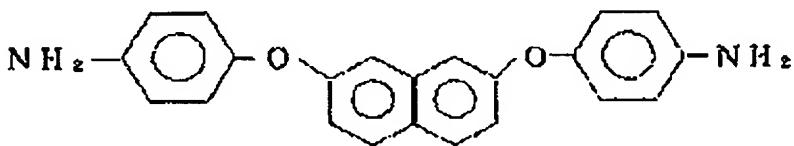
19. Ishihara discloses the production of 2,7-Bis-(4-aminophenoxy)naphthalene



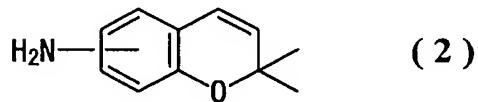
from the hydrazine reduction of 2,7-Bis-(4-nitrophenoxy) naphthalene.

*See paragraph [0009] and [0017] of the computer-generated translation of Ishihara.*

20. There is nothing in Ishihara that discloses the aminobenzopyran product recited in claim 1. *See paragraphs [0007]-[0009] of the computer-generated translation of Ishihara.*
21. The Examiner asserts that 2,7-Bis-(4-aminophenoxy) naphthalene



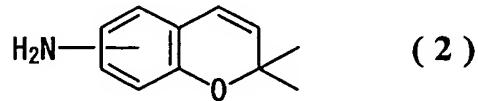
is "analogous" to the aminobenzopyran compound of formula (2) in claim 1



(2)

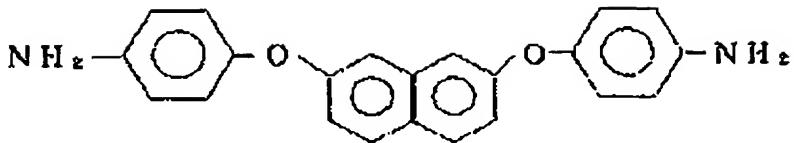
*See page 3 of the Final Rejection dated August 4, 2009.*

22. Appellants disagree.
23. The aminobenzopyran compound of formula (2) in claim 1



(2)

and 2,7-Bis-(4-aminophenoxy) naphthalene in Ishihara



are structurally distinct and nonanalogous.

24. Ishihara discloses the use of an iron chloride catalyst, palladium/activated carbon catalyst, or platinum/activated carbon catalyst in a hydrazine reduction reaction. *See* paragraph [0009] and [0017] of the computer-generated translation of Ishihara.
25. Ishihara does not indicate a preferred catalyst. *See* paragraph [0017] of the computer-generated translation of Ishihara.
26. In the comparative and experimental examples of the present specification, compound (3) refers to the 2,2-dimethyl 2H-1-benzopyran starting material (recited in claim 1). *See* paragraph [0028] on page 5 of the present specification.
27. In the comparative and experimental examples of the present specification, compound (4) refers the aminobenzoypyran product of claim 1. *See* paragraph [0028] on page 5 of the present specification.
28. In the comparative and experimental examples of the present specification, compound (5) refers to a by-product in which the olefin bond of 2,2-dimethyl 2H-1-benzopyran starting material has been reduced. *See* Fact 16; paragraph [0038] on page 5 of the present specification.

29. In Comparative Example 8 at paragraph [0046] of the present specification, in the presence of an iron chloride catalyst, the 2,2-dimethyl 2H-1-benzopyran of claim 1 (which has an olefin bond) was reduced with only a 51.2% yield of the aminobenzopyran product of claim 1. *See* paragraph [0046] on page 10 of the present specification.
30. In Comparative Example 8 at paragraph [0046] of the present specification, the hydrazine reduction of 2,2-dimethyl 2H-1-benzopyran of claim 1 in the presence of an iron chloride catalyst yields significant impurities (44.8% of unreacted 2,2-dimethyl 2H-1-benzopyran starting material and 3.7% of the undesired by-product yield in which the olefin bond of the 2,2-dimethyl 2H-1-benzopyran is reduced). *See* paragraph [0046] on page 10 of the present specification.
31. In Examples 3 and 5-20 of the present specification, in the presence of palladium and platinum catalysts, the 2,2-dimethyl 2H-1-benzopyran in claim 1 (which has an olefin bond) was reduced with a 92.5%-99.5% yield of the aminobenzopyran product recited in claim 1. *See* Table 1 on page 8 of the present specification; and paragraph [0036] on page 7 for a description of the reactants referred to in Table 1.
32. In Examples 3 and 5-20 of the present specification, the hydrazine reduction of the 2,2-dimethyl 2H-1-benzopyran in claim 1 in the presence of palladium and platinum catalysts yields only minor impurities (0%-

6.7% of unreacted 2,2-dimethyl 2H-1-benzopyran starting material and 0.1%-3.0% of the undesired by-product yield in which the olefin bond of the 2,2-dimethyl 2H-1-benzopyran is reduced). *See* Table 1 on page 8 of the present specification.

33. Ishihara provides an experimental example of a hydrazine reduction reaction of the starting material disclosed in Ishihara in the presence of an iron chloride catalyst. *See* paragraph [0019] of the computer-generated translation of Ishihara.
34. Ishihara provides a second experimental example of a reduction of the starting material disclosed in Ishihara in the presence of palladium catalyst, but hydrazine is not used in the reduction reaction. *See* paragraph [0020] of the computer-generated translation of Ishihara.
35. Ishihara does not provide an experimental example of a hydrazine reduction reaction in the presence a palladium or platinum catalyst. *See* paragraphs [0019] and [0020] of the computer-generated translation of Ishihara.
36. The experimental examples in Ishihara do not use both hydrazine and a palladium or platinum catalyst as in method claim 1. *See* paragraphs [0019] and [0020] of the computer-generated translation of Ishihara.
37. The combination of catalysts and hydrogen source in the working examples in Ishihara cannot achieve the high degree of selectivity of the

aminobenzopyran product (recited in claim 1), as produced by the claimed method. *See Comparative Examples 2 and 5-8 in paragraphs [0045] and [0046] of the present specification.*

38. Similar to the experimental example in Ishihara (discussed in Fact 35), in Comparatives Examples 2 and 5-7 in paragraph [0045] of the present specification, the 2,2-dimethyl 2H-1-benzopyran starting material of claim 1 is reduced in the presence of palladium and platinum catalysts using hydrogen gas as a hydrogen source in the reduction reaction. *See Table 2 on page 10 of the present specification (and paragraph [0036] on page 7 and paragraph [0044] on pages 9 and 10 of the present specification for a description of the reactants used in Comparative Examples 2 and 5-7); compare paragraph [0019] of the computer-generated translation of Ishihara.*
39. Comparative Examples 2 and 5-7 yield very high percentages of the undesired by-product in which the olefin bond of the 2,2-dimethyl 2H-1-benzopyran starting material is reduced and/or high percentages of unreacted 2,2-dimethyl 2H-1-benzopyran starting material. *See Table 2 on page 10 of the present specification.*
40. Similar to the experimental example in Ishihara (discussed in Fact 34), in Comparative Example 8 in paragraph [0046] of the present specification, the 2,2-dimethyl 2H-1-benzopyran starting material of

claim 1 is reduced in the presence of an iron chloride catalyst using hydrazine as a hydrogen source in the reduction reaction. *See* paragraph [0046] on page 10 of the present specification and paragraph.

41. Comparative Example 8 in paragraph [0046] of the present specification yielded significant impurities. *See* Fact 30; paragraph [0046] on page 10 of the present specification.
42. In the Final Rejection dated August 13, 2008, the Office Action states "[a]pplicant contends the instant starting reagent has olefin bond in the ring to which NO<sub>2</sub> is attached and the reaction selectively reduces the nitro group. This is not persuasive because the starting reagent of the prior art has olefin bond in the same ring. Also, both processes involved platinum or palladium catalysts (see specification, paragraph [0007]). Therefore, the selective reduction production process is inherent in the process of the prior art absent a showing to the contrary. Even then, something old or obvious does not become new upon discovery of new properties, functions, or utilities. *In re Best*, 562 F. 2d 1252; 195 USPQ 430 (CCPA, 1997) [sic]." *See* pages 4 and 5 of the Final Rejection dated August 13, 2008.
43. Appellants disagree.

## **IX. ARGUMENT**

The Final Rejection dated August 4, 2009 rejects claims 1, 2, 4, 5, 7, and 9 under 35 U.S.C. §103(a) as having been obvious over Ishihara. Appellants respectfully submit that Ishihara would not have rendered the presently claimed invention obvious to one of ordinary skill in the art.

### **A. Claims 1, 2, 4, 5, 7, and 9 Would Not Have Been Obvious Over Ishihara**

The rejection of claims 1, 2, 4, 5, 7, and 9 should be reversed because the applied reference does not disclose or provide any reason to supply all of the features of independent claim 1 or dependent claims 2, 4, 5, 7, and 9 in the claimed combination.

Appellants respectfully submit that the teachings of Ishihara would not have rendered obvious the presently claimed method because (1) the compounds of Ishihara are structurally distinct and nonanalogous starting materials and products from those of claims 1, 2, 4, 5, 7, and 9, and (2) the presently claimed invention provides highly unexpected results. Unless otherwise stated, the arguments presented herein were previously presented in the Request for Reconsideration filed on December 15, 2008 and the Pre-Appeal Brief Request for Review dated January 13, 2009. *See* pages 2-5 of the Request for Reconsideration filed on December 15, 2008; page 3 of the Pre-Appeal Brief Request for Review dated January 13, 2009.

**1. The 2,2-Dimethyl 2H-1-Benzopyran and the Aminobenzopyran Compound in Claim 1 Are Structurally Distinct From and Nonanalogous to the Reactants and Product Disclosed in Ishihara**

The Examiner asserts that the 2,7-Bis-(4-nitrophenoxy) naphthalene taught by Ishihara is analogous to the starting material of claim 1 (2,2-dimethyl 2H-1-benzopyran), shown below as Formula (1). *See* Facts 1, 2, 6, and 7. The Examiner also asserts that the 2,7-Bis-(4-aminophenoxy) naphthalene in Ishihara is "analogous" to the aminobenzopyran product of claim 1, shown below as formula (2). *See* Facts 21 and 22. The following table compares the compounds in Ishihara and the compounds recited in claim 1:

	<b>Ishihara</b>	<b>Claim 1</b>
<b>Starting Material</b>		 Olefin bond (1)
<b>Product</b>		 Olefin bond (2)

*See* Facts 3, 4, 18, and 19.

In response to the Examiner's assertions, Appellants pointed out that the presence of a common functional group (i.e., an amino group) does not make the claimed compounds analogous to the compounds disclosed in Ishihara. *See* pages 2 and 3 of the Request for Reconsideration filed on December 15, 2008.

As previously pointed out to the Examiner, one of the various structural differences between the 2,2-dimethyl 2H-1-benzopyran of claim 1 and the compounds disclosed in Ishihara is the presence of an olefin bond in the 2,2-dimethyl 2H-1-benzopyran, which is not present in the compounds of Ishihara. *See* Facts 9 and 10. The aromatic bonds in the benzene ring of 2,2-dimethyl 2H-1-benzopyran are stable, while the olefin bond (i.e., double bond) in the benzopyran is much more reactive. *See* Facts 13-17. Reduction of the olefin bond results in the production of an undesirable by-product. *See* Fact 16. In view of the reactive nature of olefin bonds, a person having ordinary skill in the art *would have expected* that the olefin bond of the starting material of claim 1 would undergo reduction during a method that reduces another group within the compound (i.e. the NO<sub>2</sub> group). *See* Fact 15. However, a person having ordinary skill in the art would *not* have expected the aromatic bonds in the compounds taught by Ishihara to undergo reduction in such a method, because aromatic bonds are known to be much more stable. *See* Fact 17. Therefore, a person having ordinary skill in the art would have had *no reasonable expectation of success or similar properties* as between the compounds of formula (1) recited in claim 1 and the compounds taught by Ishihara. *See* Facts 13-16.

Because of the aforementioned structural differences between the compounds recited in the claims on appeal and those disclosed in Ishihara

(*inter alia*, the presence of an olefin bond in the 2,2-dimethyl 2H-1-benzopyran recited in claim 1), the 2,2-Dimethyl 2H-1-Benzopyran (recited in claim 1) and the aminobenzopyran compound (recited in claim 1) are not analogous to the reactants and products disclosed in Ishihara. Facts 8-10. There is nothing in Ishihara that discloses or even suggests the compounds recited in claim 1. Facts 5 and 20. For this reason alone, the rejection should be reversed.

The Examiner also asserts that the use of analogous starting materials is *prima facie* obvious, relying upon *In re Durden*, 763 F.2d 1406 (Fed. Cir. 1985). *See* page 3 of the Final Rejection dated August 4, 2009. In response, Appellants asserted that the Examiner's reliance on *In re Durden* is misplaced. *See* page 4 of the Request for Reconsideration filed on December 15, 2008. *In re Durden* decided the question of "whether a chemical process, otherwise obvious, is patentable *because* either or both the specific starting material employed and the product obtained are novel and unobvious" (emphasis in original). *See* 763 F.2d at 1408. The Federal Circuit found that such a process is not patentable. However, the facts in *In re Durden* were entirely different from the present facts. In the presently claimed invention, there is *no* allegation that either the starting reagent or the end product are novel or unobvious. Therefore, this case is not applicable to the present situation or the presently claimed invention. For the reasons discussed above, the starting materials are *not* analogous (based on their *expected* different reactivities), and a person

having ordinary skill in the art would not have expected the chemical process to proceed in the manner as claimed. *See* Facts 8, 13-16, and 23. Therefore, one skilled in the art would not have considered the claimed method obvious based on the teachings of Ishihara. Accordingly, the rejection should also be reversed at least because the Examiner has improperly applied the holding of *In re Durden* to the present claims.

**2. The Claimed Method for Producing the Aminobenzopyran Compound Recited in Claim 1 Provides an Unexpected Degree of Product Selectivity, which is neither Disclosed nor Suggested by Ishihara**

The Examiner alleges that "there is no evidence in the specification or the prior arts [sic] that any part of the starting regents other than NO<sub>2</sub> is involved in the reaction process," and therefore assumes that the compounds are analogous. *See* Facts 11 and 12. In response, Appellants disagreed with this assumption, and asserted that the *lack* of reaction at any site other than the NO<sub>2</sub> group *is itself* the discovery of the present inventors. *See* page 3 of the Request for Reconsideration filed on December 15, 2008; page 3 of the Pre-Appeal Brief Request for Review.

Under MPEP 716.02(a)(IV):

Absence of property [sic] which a claimed invention would have been expected to possess based on the teachings of

the prior art is evidence of unobviousness. *Ex parte Mead Johnson & Co.* 227 USPQ 78 (Bd. Pat. App. & Inter. 1985) (Based on prior art disclosures, claimed compounds would have been expected to possess beta-andrenergic blocking activity; the fact that claimed compounds did not possess such activity was an unexpected result sufficient to establish unobviousness within the meaning of 35 U.S.C. 103.).

As noted above and discussed in the present specification at, for example, paragraphs [0002], [0003] and [0046], benzopyran compounds, such as the 2,2-Dimethyl 2H-1-Benzopyran (recited in claim 1), are widely known in the art as easily undergoing reduction at the olefin bond. *See* Fact 13. As noted above, reduction of this olefin bond results in the production of an undesirable by-product. Fact 16.

A person having ordinary skill in the art would *not* have expected, prior to the claimed invention, the aromatic bonds in the compounds taught by Ishihara to undergo reduction in such a method, because aromatic bonds are known to be much more stable than olefin bonds. *See* Fact 17. Therefore, a person having ordinary skill in the art would have had *no reasonable expectation of success or similar properties* as between the compounds of formula (1) in claim 1 and the compounds taught by Ishihara, because Ishihara's compounds only include aromatic bonds and do not include any olefin bonds. *See* Facts 9 and 17.

In particular, the Examiner makes *no* showing that a person having ordinary skill in the art *would have expected at the time of the invention* that no other part of the compound of formula (1) (other than NO<sub>2</sub>) would be involved in the reaction process. *See* Facts 13, 15, and 16. That is, the Examiner does not establish why one of ordinary skill in the art would have expected that the known more reactive olefin bond in the compounds of formula (1) would not also participate in the reaction process. *See* Fact 13, 15, and 16. Absent such a showing, the Examiner impermissibly uses the present inventors' own disclosure as evidence of the asserted obviousness of the presently claimed invention. *See* Fact 13, 15, and 16.

The presently claimed invention displays highly *unexpected results* of avoiding reduction of the olefin bond, such that minimal undesired by-products are formed and high selectivity of the desired aminobenzopyran product is achieved. *See* Facts 17, 31, and 32. Based on the teachings of Ishihara, one skilled in the art would not have expected the results achieved by the claimed method. *See* Facts 17, 29, 30, and 33. Ishihara discloses an experimental example of a hydrazine reduction in the presence of an iron chloride catalyst. Fact 33. Similarly, the present specification provides a comparative example of a hydrazine reduction of the 2,2-dimethyl 2H-1-benzopyran (recited in claim 1) in the presence of iron chloride. *See* Facts 29 and 30. Because of the similarities between this comparative example and the claimed method, this

comparative example mirrors a comparison of the claimed method to the method used in the experimental example in Ishihara (i.e., the closest prior art).

*See In re Geiger*, 815 F.2d 686, 689 (Fed. Cir. 1987) (evidence rebutted *prima facie* case by comparing claimed invention with the most relevant prior art).

Comparative example 8 in paragraph [0046] of the present specification shows that reduction with  $\text{FeCl}_3$  results in much higher amounts of the undesired by-product (i.e., compound (5) in which the olefin bond is reduced) and unreacted starting material (i.e., compound (3)), as compared to the presently claimed method. Facts 26-32, 40, and 41. In Comparative Example 8 of the present specification, in the presence of an *iron chloride* catalyst, the 2,2-dimethyl 2H-1-benzopyran (recited in claim 1) with an olefin bond was reduced with only a 51.2% yield of the aminobenzopyran product recited in claim 1 with significant impurities. Fact 29. In contrast, in Examples 3 and 5-20 of the present specification, in the presence of *palladium and platinum* catalysts, the 2,2-dimethyl 2H-1-benzopyran (recited in claim 1) with an olefin bond was reduced with over a 92.5%-99.5% yield of the aminobenzopyran product recited in claim 1 with only minor impurities. Fact 31. The superior results of claimed method are unexpected over Ishihara because Ishihara treats all of the catalysts as being interchangeable. *See* Facts 24 and 25. Ishihara does not indicate a preferred catalyst among the iron chloride catalyst, palladium/activated carbon, and platinum/activated carbon catalysts disclosed in Ishihara. Fact 25. Thus,

Ishihara fails to disclose or suggest the unexpected results that the claimed method achieves by using both hydrazine and the palladium and platinum catalysts recited in claim 1.

Furthermore, the second experimental example in Ishihara also fails to disclose or suggest the unexpected results that the claimed method achieves by using both hydrazine and the palladium and platinum catalysts recited in claim 1. In the second experimental example of Ishihara, Ishihara discloses a reduction using hydrogen (rather than hydrazine) in the presence of a palladium catalyst. *See* Fact 34. Similarly, the present specification provides comparative examples of a reduction of the 2,2-dimethyl 2H-1-benzopyran (recited in claim 1) using hydrogen (rather than hydrazine) in the presence of palladium and platinum catalysts. *See* Facts 38 and 39. Paragraph [0045] of the present specification shows that the reduction with palladium and platinum in the presence of hydrogen gas results in much higher amounts of the undesired by-product (i.e., compound (5) in which the olefin bond is reduced), as compared to the presently claimed method. Facts 31, 32, 38 and 39. Once again, the superior results of claimed method are unexpected over Ishihara because Ishihara treats all of the catalysts as being interchangeable. *See* Facts 24 and 25.

In contrast to method claim 1, Ishihara does not provide a working example that uses both hydrazine and a palladium or platinum catalyst as in the

method of claim 1. *See* Facts 35 and 36. Based on the results in the comparative examples of the present specification (as discussed above), the iron chloride catalyst and hydrogen source in the experimental examples in Ishihara cannot achieve the high degree of selectivity of the aminobenzopyran product (recited in claim 1), as produced by the claimed method which uses both hydrazine as a hydrogen source and the palladium or platinum catalyst recited in claim 1. *See* Fact 37. For at least these reasons, there is nothing in Ishihara that discloses or suggests the unexpected results that the claimed method achieves by using both hydrazine and the palladium and platinum catalysts recited in claim 1.

Lastly, Ishihara nowhere teaches or suggests that any particular catalyst would achieve any different results, because the reactant compounds of Ishihara are very different from those of claim 1 above (as discussed above), such that they would not undergo the reduction reaction to form a by-product such as formula (5) (i.e., because, again, the compounds taught by Ishihara do not contain olefin bonds). *See* Facts 8 and 20. The results produced by the presently claimed invention are therefore not taught by Ishihara, nor are they even applicable to the teachings of Ishihara. *See* Facts 8, 9, 20, and 37-41.

The Examiner asserts that it would have been obvious to arrive at the claimed invention based on the teachings of Ishihara, under *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398 (2007), *United States v. Adams*, 383 U.S. 49

(1966); *In re Aller*, 22 F.2d 454 (CCPA 1955), and *In re Best*, 562 F.2d 1252 (CCPA 1977). See Facts 42 and 43; pages 4 and 5 of the Final Rejection dated August 13, 2008; and pages 3-5 of the Final Rejection dated August 4, 2009. Under *KSR* (and similarly *Adams*, *Aller*, and *Best*), the "mere substitution of one known element for another" is considered obvious. *United States v. Adams*, 383 U.S. 49 (1966) (cited in *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398 (2007)). However, for the reasons discussed above, the differences between the compounds recited in claim 1 and the compounds in Ishihara constitute more than a simple substitution; these compounds recited in claim 1 are structurally distinct and nonanalogous to the compounds disclosed in Ishihara. Facts 8-14 and 23. In addition, the claimed invention produces far more than a predictable result. Facts 13-18 and 24-41. Thus, the Examiner has improperly applied the holdings and facts of those case to the facts here. For this additional reason, Ishihara fails to disclose or to have rendered obvious the claimed combination of features (or the advantages stemming therefrom).

\*\*\*\*\*

For all of the reasons discussed above, it is respectfully submitted that the rejections are in error and that claims 1, 2, 4, 5, 7, and 9 are in condition for allowance. For all of the above reasons, Appellants respectfully request this Honorable Board to reverse the rejections of claims 1, 2, 4, 5, 7, and 9.

Respectfully submitted,



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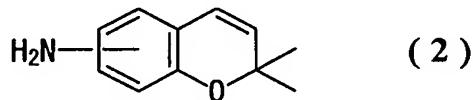
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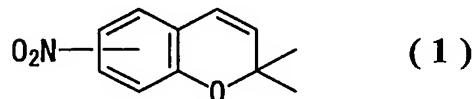
Filed: November 4, 2009

X. **APPENDIX A - CLAIMS SECTION**

1. (Rejected) A method for producing aminobenzopyran compound of formula (2)

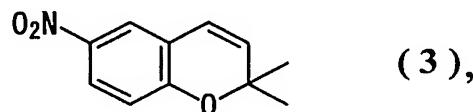


characterized by reducing a nitro group on 2,2-dimethyl 2H-1-benzopyran compound of formula (1)

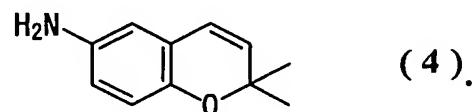


with hydrazine in the presence of platinum or palladium as a metal catalyst.

2. (Rejected) The method for producing aminobenzopyran compound according to claim 1, wherein the 2,2-dimethyl 2H-1-benzopyran compound of formula (1) is 2,2-dimethyl-6-nitro 2H-1-benzopyran of formula (3)



the aminobenzopyran compound of formula (2) is 6-amino-2,2-dimethyl 2H-1-benzopyran of formula (4)



3. (Canceled)

4. (Rejected) The method for producing aminobenzopyran compound according claim 1, wherein the metal in the metal catalyst is platinum.

5. (Rejected) The method for producing aminobenzopyran compound according to claim 1, wherein the hydrazine is used in an amount of 2 to 5 molar equivalents to 1 molar equivalent of 2,2-dimethyl 2H-1-benzopyran compound.

6. (Canceled)

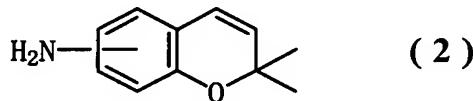
7. (Rejected) The method for producing aminobenzopyran compound according to claim 2, wherein the hydrazine is used in an amount of 2 to 5 molar equivalents to 1 molar equivalent of 2,2-dimethyl 2H-1-benzopyran compound.

8. (Canceled)

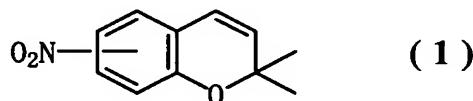
9. (Rejected) The method for producing aminobenzopyran compound according to claim 4, wherein the hydrazine is used in an amount of 2 to 5 molar equivalents to 1 molar equivalent of 2,2-dimethyl 2H-1-benzopyran compound.

**XI. APPENDIX B - CLAIM SUPPORT  
AND DRAWING ANALYSIS SECTION**

1. (Rejected) A method for producing aminobenzopyran compound of formula (2)



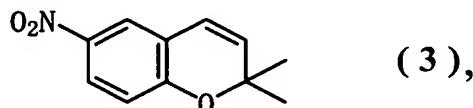
{page 2, lines 2-4} characterized by reducing a nitro group on 2,2-dimethyl 2H-1-benzopyran compound of formula (1) {page 2, lines 5-7}



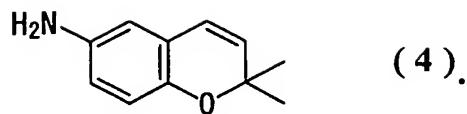
with hydrazine in the presence of platinum or palladium as a metal catalyst

{page 2, lines 8 and 18-20}.

2. (Rejected) The method for producing aminobenzopyran compound according to claim 1, wherein the 2,2-dimethyl 2H-1-benzopyran compound of formula (1) is 2,2-dimethyl-6-nitro 2H-1-benzopyran of formula (3) {page 2, lines 13-17}



the aminobenzopyran compound of formula (2) is 6-amino-2,2-dimethyl 2H-1-benzopyran of formula (4) {page 2, lines 9-12}



(4).

4. (Rejected) The method for producing aminobenzopyran compound according claim 1, wherein the metal in the metal catalyst is platinum {page 2, line 20}.

5. (Rejected) The method for producing aminobenzopyran compound according to claim 1, wherein the hydrazine is used in an amount of 2 to 5 molar equivalents to 1 molar equivalent of 2,2-dimethyl 2H-1-benzopyran compound {page 2, lines 21-24}.

7. (Rejected) The method for producing aminobenzopyran compound according to claim 2, wherein the hydrazine is used in an amount of 2 to 5 molar equivalents to 1 molar equivalent of 2,2-dimethyl 2H-1-benzopyran compound {page 2, lines 21-24}.

9. (Rejected) The method for producing aminobenzopyran compound according to claim 4, wherein the hydrazine is used in an amount of 2 to 5 molar equivalents to 1 molar equivalent of 2,2-dimethyl 2H-1-benzopyran compound {page 2, lines 21-24}.

**XII. APPENDIX C - MEANS OR STEP PLUS  
FUNCTION ANALYSIS SECTION**

NONE

**XIII. APPENDIX D - EVIDENCE SECTION**

A copy of each of the following items of evidence relied on by the Appellant and/or the Examiner in this appeal is attached:

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## \* NOTICES \*

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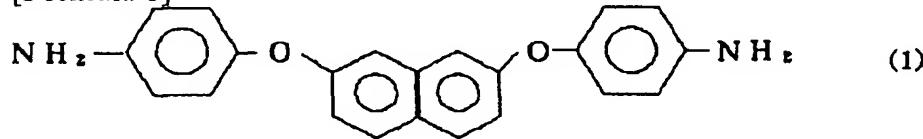
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## CLAIMS

[Claim(s)]

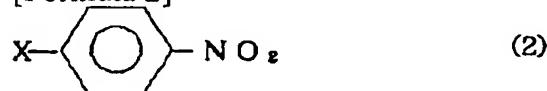
[Claim 1] Formula (1) (\*\* 1)

[Formula 1]



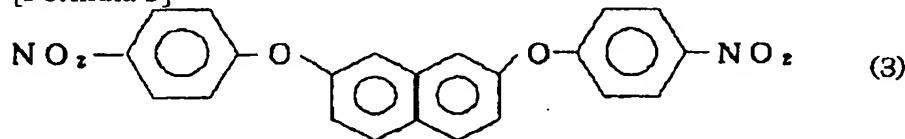
2 come out of and expressed, 7-screw (4-amino phenoxy) naphthalene [claim 2] Formula (2) (\*\* 2)

### 〔Formula 2〕



The formula which come out, and the p-halogeno nitrobenzene expressed and 2 and 7-dihydroxy naphthalene are made to react under existence of an alkali and in aprotic polar solvents, and is obtained (3) (\*\*-izing 2)

[Formula 3]



2 come out of and expressed, 2 expressed with the formula (1) characterized by being obtained by returning 7-screw (4-nitro phenoxy) naphthalene, the manufacture approach of 7-screw (4- amino phenoxy) naphthalene.

[Claim 3] 2 according to claim 2 characterized by an alkali being at least one sort chosen from the group which consists of the oxide, the hydroxide, the carbonate, the hydrogencarbonate, hydride, and alkoxides of alkali metal, the manufacture approach of 7-screw (4-amino phenoxy) naphthalene.

[Claim 4] 2 according to claim 3 characterized by using an alkali 2Eq or more to 1Eq of 2 and 7-dihydroxy naphthalene, the manufacture approach of 7-screw (4-amino phenoxy) naphthalene.

[Claim 5] an aprotic polar solvent -- N-methyl formamide, N,N-dimethylformamide, dimethyl sulfoxide, a dimethyl sulfone, a sulfolane, 1-methyl-2-pyrrolidinone, 1,3-dimethyl-2-imidazolidinone, N and N, N', and N' - tetramethyl urea, hexa methyl phospho TORIAMIDO, and N The manufacture approach of 2 according to claim 2 which is at least one sort chosen from the group which consists of a - methyl pyrrolidone, and 7-screw (4-amino phenoxy) naphthalene.

[Translation done.]

## \* NOTICES \*

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2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Industrial Application] This invention relates to new 2, 7-screw (4-amino phenoxy) naphthalene, and its manufacture approach. This 2 and 7-screw (4-amino phenoxy) naphthalene (it outlines Following BAPN) can be used as a curing agent of other maleimide compounds or an epoxy compound except being used as a raw material of a polyamide, polyimide, polyamidoimide, bismaleimide, and an epoxy resin.

#### [0002]

[Description of the Prior Art] This BAPN is a compound which is not known conventionally. However, 2 and 6-screw (4-amino phenoxy) naphthalene which is a position isomerism pair is a known compound, for example, is indicated by JP,64-29431,A, JP,64-33166,A, etc.

#### [0003]

[Problem(s) to be Solved by the Invention] In recent years, it is required that a heat-resistant resin ingredient should satisfy many engine performance represented by the flexibility and fabrication nature in use as composite besides the thermal and mechanical engine performance. Although polyimide resin attracted attention as such an ingredient, while polyimide resin was highly efficient, it had the fault that fabrication was difficult. For example, since the aromatic polyimide (Du, pont, trade name "Vespel") which consists of most typical 4, 4'-diamino diphenyl ether, and a pyromellitic acid anhydride is insoluble and non-\*\*, it uses the special approach of powder sinter molding. However, since the workpiece of a complicated configuration being hard to be obtained by this approach, and obtaining satisfactory mold goods must finish-machine mold goods by cutting etc. further, there is a big fault that processing cost becomes high.

[0004] The method of improving various diamine components of a raw material is tried in order to improve such a fault. For example, it is an approach by installation of the ether linkage radical to intramolecular, the increment in a chain, etc. However, it is hard to say that that to which military requirements, such as flexibility and fabrication nature, are satisfied completely was found out while being tried to current. On the other hand, having liquid crystallinity is known and some polymers with a naphthalene frame are considered as a means which raises flexibility and fabrication nature. Moreover, compared with a linear joint format, the joint format with crease structure can expect flexible improvement.

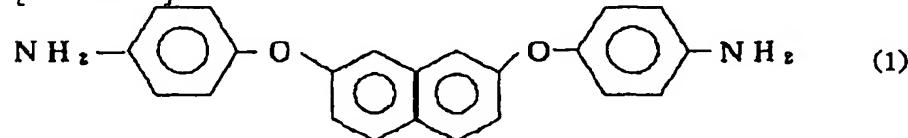
[0005] Therefore, the diamine compound of a resin raw material in which flexibility and fabrication nature are satisfied enough is demanded combining these approaches.

#### [0006]

[Means for Solving the Problem] this invention persons came to complete this invention, as a result of inquiring wholeheartedly, in order to solve said technical problem. That is, this invention is a formula (1) (\*\* 4).

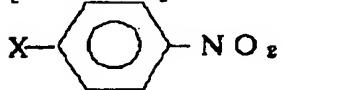
#### [0007]

#### [Formula 4]



2 come out of and expressed, 7-screw (4-amino phenoxy) naphthalene, and a formula (2) (\*\* 5)  
[0008]

[Formula 5]

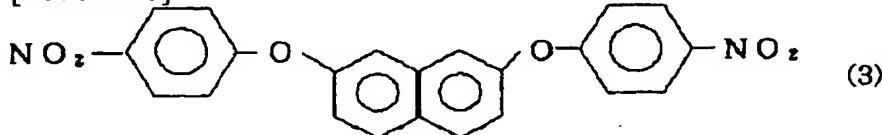


(2)

The formula which come out, and the p-halogeno nitrobenzene expressed and 2 and 7-dihydroxy naphthalene are made to react under existence of a base and in aprotic polar solvents, and is obtained (3) (\*\* 6)

[0009]

[Formula 6]



(3)

It comes out and the approach of manufacturing 2 of a formula (1) and 7-screw (4-amino phenoxy) naphthalene by returning 2 and 7-screw (4-nitro phenoxy) naphthalene expressed is offered.

[0010] As for BAPN of this invention, the two benzene rings are connected with the naphthalene ring by the ether group, respectively, and the ether group and amino group of both ends are located in the para position, respectively. Therefore, the polyimide resin obtained from this diamine has the molding workability which is excellent in thermal resistance and a mechanical property, and originates in the crease structure of a molecule when the permutation location of the ether group to a naphthalene frame is only 2 and 7-. For example, 5% weight reduction temperature 3, 3', and 4 and the polyimide obtained from 4'-diphenyl ether tetracarboxylic dianhydride indicate thermal resistance to be was 555 degrees C, and the melt viscosity by the quantity-ized type flow tester which shows fabrication nature was 9000poise at 400 degrees C.

[0011] This BAPN can obtain 2 expressed with a formula (2), and 7-screw (4-nitro phenoxy) naphthalene by the condensation reaction of 2 and 7-dihydroxy naphthalene and a p-halogeno nitrobenzene, and can return and manufacture this. If how to manufacture BAPN of this invention is explained concretely, at the process (reaction of a first stage) which condenses 2 and 7-dihydroxy naphthalene in a p-halogeno nitrobenzene and an aprotic polar solvent, and manufactures 2 and 7-screw (4-nitro phenoxy) naphthalene, 2.0-3.0 mols of p-nitro halogeno benzene of another raw material will be used to 2 of a raw material, and 7-dihydroxy naphthalene so that it may become 2.05-2.5 mols preferably. As this p-halogeno nitrobenzene, it is p-fluoro nitrobenzene, p-chloronitrobenzene, p-BUROMO nitrobenzene, p-iodine nitrobenzene, etc., and, specifically, p-chloronitrobenzene is industrially desirable.

[0012] The alkali used in the reaction of this first stage is the oxide, the hydroxide, the carbonate, the hydrogencarbonate, hydride, and alkoxides of alkali metal, and are a hydroxide and a carbonate preferably. Specifically, sodium oxide, lithium oxide, potassium-hydroxide, sodium-hydroxide, lithium-hydroxide, potassium carbonate, sodium-carbonate, potassium-hydrogencarbonate, sodium-hydrogencarbonate, sodium hydride, and potassium-t-butoxide, sodium methoxide, a sodium ethoxide, etc. are used. To 2 of a raw material, and 7-dihydroxy naphthalene, the 2.05-2.5Eq smallness of 2Eq or more and this better \*\* is superfluous, and the amount used is usually performed. At this reaction, quarternary ammonium salt, the 4th class microcosmic salt or a large annular polyether like crown ether, a \*\*\*\*\* annular polyether like cryptate, a nitrogen-containing chain-like polyether, a polyethylene glycol and phase transfer catalysis like that alkyl ether, copper powder, copper salt, etc. may be added as a reaction accelerator. An aprotic polar solvent is used as a reaction solvent. Specifically, N-methyl formamide, N,N-dimethylformamide, dimethyl sulfoxide, a dimethyl sulfone, a sulfolane, 1-methyl-2-pyrrolidinone, 1,3-dimethyl-2-imidazolidinone, N and N, N', N'-tetramethyl urea, hexa methyl phospho TORIAMIDO, N-methyl pyrrolidone, etc. are mentioned. Although especially the amount of these solvents used is not limited, 1 - 10 weight twice are usually enough as it to a raw material.

[0013] It can also react on the occasion of implementation of a reaction, carrying out azeotropy dehydration of the azeotropy dehydrating agents, such as toluene, under little \*\*\* and heating reflux. The range of 20-240 degrees C of reaction temperature is usually 60-160 degrees C preferably, and the range of reaction time is 1 - 10 hours. Thin-layer chromatography, high performance chromatography, etc. can determine the terminal point of a reaction. filtering the product which condensed reaction mixture, or discharged and deposited in water as it is after reaction termination -- rough -- it can obtain as 2 and 7-screw (4-nitro phenoxy) naphthalene.

[0014] Next, how (reaction of a second stage) to return obtained 2 and 7-screw (4-nitro phenoxy) naphthalene, and to obtain BAPN is explained. Although the approach (for example, a new experimental science lecture, 15 volumes, oxidation and reduction [II], Maruzen (1977)) of usually returning a nitro group to the amino group is applicable at this reaction, catalytic reduction or hydrazine reduction is industrially desirable. In the case of catalytic reduction, as a reduction catalyst used, the metal catalyst generally used for catalytic reduction, for example, nickel, palladium, platinum, a rhodium, a ruthenium, cobalt, copper, etc. can be used. It is desirable to use a palladium catalyst industrially. These catalysts can be used in the state of a metal, and it makes support carrier surfaces, such as carbon, a barium sulfate, silica gel, an alumina, and cerite, and uses, and nickel, cobalt, copper, etc. are usually used also as a Raney catalyst. Although especially a limit does not have the amount of the catalyst used, when it is 0.01 - 10% of the weight of the range and usually uses it in the state of a metal to a raw material, in the case where support is made to support two to 8% of the weight, it is 0.1 - 5% of the weight of the range.

[0015] As a reaction solvent, especially if inactive for a reaction, it will not be limited. For example, aprotic polar solvents, such as ester, such as aromatic hydrocarbon, such as aliphatic hydrocarbon, such as ether, such as glycols, such as alcohols, such as a methanol, ethanol, and isopropyl alcohol, ethylene glycol, and propylene glycol, the ether, dioxane, a tetrahydrofuran, and methyl cellosolve, a hexane, and a cyclohexane, benzene, toluene, and a xylene, ethyl acetate, and butyl acetate, and N,N-dimethylformamide, can be used. In addition, when the reaction solvent with which it does not mix with water is used, and advance of a reaction is slow, it can speed up by adding phase transfer catalysis like quarternary ammonium salt and the fourth class phosphonium salt currently generally used.

[0016] Although the amount which is made to suspend a raw material or is sufficient for making it dissolve in completeness is especially enough as the amount of the solvent used and it is not limited, 0.5 - 10 weight twice are usually enough as it to a raw material. Reaction temperature does not have especially limitation. Generally, the range of 20-200 degrees C, especially 20-100 degrees C are desirable. Moreover, reaction pressure is usually ordinary pressure - 50atm extent. A reaction usually adds a catalyst in the condition of having made the solvent dissolving or suspending a raw material, subsequently to the bottom of stirring, introduces hydrogen at predetermined temperature, and performs a reduction reaction. A hydrogen absorbed amount, thin-layer chromatography, high performance chromatography, etc. can determine the terminal point of a reaction.

[0017] on the other hand -- the case of hydrazine reduction -- a hydrazine -- usually -- the amount of theory -- receiving -- small -- being superfluous -- the \*\*\* reduction reaction for the amounts of 1.2 - 2 double is carried out preferably. As a catalyst, the aforementioned metal catalyst or aforementioned ferric chloride catalyst generally used for catalytic reduction is used. Specifically, the catalyst which made palladium/activated carbon, platinum/activated carbon, or a ferric chloride stick to activated carbon is used. Especially a limit does not have the amount of the catalyst used, and it is usually 0.01 - 30% of the weight of the range as a metal to the nitro compound of a raw material.

[0018] As a reaction solvent, the same solvent as the case of catalytic reduction can be used. There is no reaction temperature and, generally the range of 20-150 degrees C, especially its 40-120 degrees C are [ especially limitation ] desirable. A reaction usually adds a catalyst in the condition of having made the solvent dissolving or suspending a raw material, subsequently to the bottom of stirring, trickles a hydrazine at predetermined temperature, and performs a reduction reaction. Thin-layer chromatography etc. can determine a reaction terminal point. After reaction termination, after filtering reaction mixture at the time of heat and removing a catalyst, a solvent is distilled off if needed, and if it cools or dilutes with water etc., the target diamine will be obtained with good yield.

Hereafter, an example explains the approach of this invention still more concretely.

[0019]

[Example]

The temperature up of the 2 and 7-dihydroxy naphthalene 160.1g (1.0 mols), p-nitrochlorobenzene 346.7g (2.2 mols), 165.6g [ of potassium carbonate ] (1.2 mols), 500ml [ of N.N-dimethylformamide ], and toluene 75ml was inserted in and carried out to the glass reaction container equipped with the example 1 [reaction of first stage] stirrer, the thermometer, and the reflux condenser with a water separator, the internal temperature was kept at 140-145 degrees C, and stirring was continued for 4 hours. In the meantime, uptake was carried out with the water separator which has equipped the reflux condenser with the water generated at a reaction. After reaction termination, after annealing an internal temperature to 120 degrees C, it filtered at the time of heat and mineral salt was removed, and it washed by 180ml N.N-dimethylformamide. When it cooled slowly to 25 degrees C after 125ml water was dropped at filtrate, the crystal deposited. this -- filtering -- washing -- drying -- rough -- 2 and 7-screw (4-nitro phenoxy) naphthalene 386.7g (96.1% of yield) was obtained. This was recrystallized in 2l. 2-methoxyethanol, and energy 2 and 7-screw (4-nitro phenoxy) naphthalene 352.6g (87.6% of yield) was obtained. The purity by high performance chromatography was 99.9% (Area%). Melting point The temperature up of the internal temperature was carried out to 100 degrees C, inserting in and stirring 2 and 7-screw (4-nitro phenoxy) naphthalene 120.7g (0.3 mols) and the above-mentioned 2-methoxyethanol 600g in the glass reaction container equipped with 169.8-170.6 degrees C [the reaction of a second stage] next the stirrer, the thermometer, and the reflux condenser. Subsequently, the hydrazine water solution was dropped 80 93.8g (1.5 mols)% in 2 hours, having added 6.0g of activated carbon, and 0.27g of ferric chlorides, and keeping an internal temperature at 90-110 degrees C. The reaction was ended for stirring continuously [ for further 1 hour ] after dropping termination. Next, when the reaction solution was filtered at the time of heat, 327g water was added to the obtained solution and it cooled slowly to 25 degrees C at this temperature, the crystal deposited. This was dried after filtration and washing and 91.9g (89.5% of yield) 2 and 7-screw (4-amino phenoxy) naphthalene was obtained. The purity by high performance chromatography was 99.0% (Area%).

Melting point 170.9-172.4 degrees C Elemental-analysis result C H N Calculated value (%) 77.2 5.3 8.2 Measured value (%) 77.0 5.6 8.1 [0020] 2 and 7-dihydroxy naphthalene 80.1g (0.5 mols), p-nitro bromobenzene 222.3g (1.1 mols), 82.8g [ of potassium carbonate ] (0.6g), 250ml [ of N.N-dimethylformamide ], and toluene 38ml was inserted in the glass reaction container equipped with the example 2 [reaction of first stage] stirrer, the thermometer, and the reflux condenser with a water separator, and the temperature up of the internal temperature was carried out to it to 140-145 degrees C. The reaction was ended for stirring continuously [ for 5 hours ], maintaining this temperature. In the meantime, uptake was carried out with the water separator which has equipped the reflux condenser with the water generated at a reaction. After reaction termination, after cooling an internal temperature to 130 degrees C, it filtered at the time of heat and mineral salt was removed, and it washed by 90ml N.N-dimethylformamide. When it cooled to 25 degrees C after 62.5ml water was dropped at filtrate, the crystal deposited. This was filtered, it washed and dried and 2 and 7-screw (4-nitro phenoxy) naphthalene 183.5g (91.2% of yield) was obtained. It recrystallized in 950ml 2-methoxyethanol, and energy 2 and 7-screw (4-nitro phenoxy) naphthalene 171.8g (85.2% of yield) was obtained. The purity by high performance chromatography was 99.4%.

[Reaction of a second stage] To next, the glass well-closed container equipped with the stirrer, the reflux condenser, and the thermometer Above 2, 7-screw (4-nitro phenoxy) naphthalene 80.5g (0.2 mols), 5% palladium / 1.6g [ of activated carbon catalysts ] (em I KEMUKYATTO), and 2-methoxyethanol 480g was inserted in, and in the temperature of 35-40 degrees C, when hydrogen was introduced stirring, 27.11. (1.21 mols) hydrogen was absorbed in about 9 hours. After reaction termination, the reaction solution was filtered at this temperature and the catalyst was removed. Next, the temperature up of this solution temperature was carried out to 70 degrees C, and when 250g water was added and it cooled slowly to 25 degrees C, the crystal deposited. This was dried after filtration and washing and 59.1g (86.3% of yield) 2 and 7-screw (4-amino phenoxy) naphthalene was obtained. The purity by high performance chromatography was 99.0%.

[0021] the container equipped with application 1 stirrer, a reflux condenser, a water separator, and

nitrogen installation tubing -- 2, 7-screw (4-amino phenoxy) naphthalene 34.2g (0.1 mols) and 3, 3', 4, and 4' -- 29.45g [ of - diphenyl ether tetracarboxylic dianhydride ] (0.095 mols) and 1.78g [ of phthalic anhydride ] (0.012 mols) gamma-picoline 1.4g and m-cresol 255g were inserted in, and the heating temperature up was carried out to 145 degrees C, stirring under nitrogen-gas-atmosphere mind. The distillate of about 3.5 cc water was checked in the meantime. The reaction was performed at further 140-150 degrees C for 4 hours. Then, after cooling to the room temperature and discharging to about 1.5l. methyl ethyl ketone, it carried out the \*\* exception. After discharging this polyimide powder to a methyl ethyl ketone, reduced pressure drying was carried out at 180 degrees C for 24 hours, and 60.6g (98.5% of yield) polyimide powder was obtained. the logarithm of the polyimide powder obtained in this way -- viscosity was 0.51 dl/g. in addition, a logarithm -- viscosity is the value measured in 35 degrees C, after carrying out the heating dissolution of the 0.50g of the polyimide powder at p-KURORU phenol / 100ml of phenol (weight ratios 9/1) mixed solvents. The glass transition temperature (Tg) of this polyimide was 235 degrees C. Moreover, 5% weight reduction temperature in the inside of air was 555 degrees C. In the infrared-absorption-spectrum Fig. of this polyimide powder, the absorption of the 1780cm<sup>-1</sup> and 1720cm<sup>-1</sup> neighborhood which is the characteristic absorption band of imide was accepted notably.

[0022] Moreover, the elemental-analysis value of the obtained polyimide powder was as follows. elemental-analysis result C H N Calculated value (%) 74.1 3.3 4.6 Measured value (%) 74.0 3.4 4.6 - this polyimide powder was insoluble to halogenated hydrocarbon, such as methylene chloride and chloroform.

[0023] Furthermore, the melt viscosity of this polyimide used the quantity-ized type flow tester, and measured him using the orifice with the load of 100kg and a diameter [ of 0.1cm ], and a die length of 1cm. Those with 9000poise in 400 degrees C and the obtained strand were rich in the flexibility of dark reddish-brown transparency.

[0024]

[Effect of the Invention] 2 by this invention and 7-screw (4-amino phenoxy) naphthalene are new matter, and can offer polyimide resin \*\* of high thermal resistance which was excellent in flexibility or a moldability by making this into a raw material.

---

[Translation done.]



# UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,686	04/19/2005	Takanori Shimizu	122760	8331
25944	7590	08/13/2008	EXAMINER	
OLIFF & BERRIDGE, PLC P.O. BOX 320850 ALEXANDRIA, VA 22320-4850			SOLOLA, TAOFIQ A	
		ART UNIT	PAPER NUMBER	
		1625		
		MAIL DATE	DELIVERY MODE	
		08/13/2008	PAPER	

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>
	10/524,686	SHIMIZU ET AL.
	<b>Examiner</b>	<b>Art Unit</b>
	Taofiq A. Solola	1625

— The MAILING DATE of this communication appears on the cover sheet with the correspondence address —  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### **Status**

1) Responsive to communication(s) filed on 06 May 2008.  
 2a) This action is **FINAL**.      2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### **Disposition of Claims**

4) Claim(s) 1-9 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-9 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### **Application Papers**

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### **Priority under 35 U.S.C. § 119**

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### **Attachment(s)**

1) Notice of References Cited (PTO-892)  
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)  
 3) Information Disclosure Statement(s) (PTO/SB/08)  
 Paper No(s)/Mail Date \_\_\_\_\_.

4) Interview Summary (PTO-413)  
 Paper No(s)/Mail Date. \_\_\_\_\_.  
 5) Notice of Informal Patent Application  
 6) Other: \_\_\_\_\_.

Claims 1-9 are pending in this application.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-9, are rejected under 35 U.S.C. 103(a) as being unpatentable over Hiroko et al., JP 5078289.

Applicant claims a process of making aminobenzopyran of formula 2, comprising reducing nitrobenzopyran of formula 1 with hydrazine in the presence of a metal catalyst. In preferred embodiments the catalyst is platinum or palladium and the molar equivalent of hydrazine to compound 1, is 2 to 5.

**Determination of the scope and content of the prior art (MPEP 2141.01)**

Hiroko et al., teach a process of making 4-amino phenoxy naphthalene by reducing 4-nitro phenoxy naphthalene with hydrazine in the presence of platinum or palladium catalyst and the molar equivalent of hydrazine to the nitro compound, is 1.2 to 2. See [0017].

**Ascertainment of the difference between the prior art and the claims (MPEP 2141.02)**

The difference between the instant invention and that of Hiroko et al., is that the starting materials are analogous compounds and therefore the products. Also the ratios of hydrazine to the starting reagents are different.

**Finding of prima facie obviousness--rational and motivation (MPEP 2142.2413)**

However, the use of analogous starting materials in a well-known process is *prima facie* obvious. *In re Durden*, 226 USPQ 359 (1985). There is no evidence in the specification or the prior arts that any part of the starting reagents other than NO<sub>2</sub> is involved in the reaction process. Changing the molar equivalent of hydrazine to the starting reagent is an obvious modification available to the preference of an artisan, and does not rise to the level of invention under the US patent practice. It is a mere optimization of a variable, which is not patentable absent unexpected result due to the variable, which is different in kind and not merely in degree from that of the prior art. *In re Aller*, 22 F.2d 454,105 USPG 233 (CCPA, 1955).

Therefore, the instant invention is *prima facie* obvious from the teaching of the prior art. One of ordinary skill in the art would have known to use analogous starting reagent, at the time the instant process was made. The motivation is from knowing that analogous starting reagents would have similar chemical reactions.

Alternatively, given the teaching of Hiroko et al., it would have been obvious to try reduction of any nitro compound with hydrazine in the presence of platinum or palladium catalyst at the time the invention was made.

When there is motivation

to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under [35 USC] 103.

*KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct 1727,----, 82 USPQ2d 1385, 1397 (2007).

Alternatively, given the teaching of Hiroko et al., one would have known to reduce any nitro compound with hydrazine in the presence of platinum or palladium catalyst at the time the invention was made. "When a work is available in one field of endeavour, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, §103 likely bars its patentability. For the same reason if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technology is obvious unless its actual application is beyond his or her skill." "One of the ways in which a patent's subject matter can be proved obvious is by noting that there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims." *KSR Int. Co. v. Teleflex Inc*, 550 U.S. ----, 82 USPQ2d 1385 (2007).

Alternatively, applicant has done nothing more than substitutes analogous starting reagents in a well known process. However, such substitution is obvious from the prior art. "When a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result." *United States v. Adams*, 383 U.S. 49, 50-51 (1966). Cited in *KSR Int. Co. v. Teleflex Inc*, 550 U.S. ----, 82 USPQ2d 1385 (2007). The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR, supra*.

#### ***Response to Argument***

Applicant's arguments filed 5/6/08 have been fully considered but they are not persuasive. Applicant contends the instant starting reagent has olefin bond in the ring to which

NO<sub>2</sub> is attached and the reaction selectively reduces the nitro group. This is not persuasive because the starting reagent of the prior art has olefin bond in the same ring. Also, both processes involved platinum or palladium catalysts (see specification, paragraph [0007]. Therefore, the selective reduction process is inherent in the process of the prior art absent a showing to the contrary. Even then, something old or obvious does not become new upon discovery of new properties, functions or utilities, *In re Best*, 562 F.2d 1252; 195 USPQ 430 (CCPA, 1977).

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

***Telephone Inquiry***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Taofiq A. Solola, PhD. JD., whose telephone number is (571) 272-0709.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Janet Andres, can be reached on (571) 272-0867. The fax phone number for this Group is (571) 273-8300.

Application/Control Number:  
10/524,686  
Art Unit: 1625

Page 6

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (571) 272-1600.

/Taofiq A. Solola/

Primary Examiner, Art Unit 1625

August 9, 2008

**PATENT APPLICATION**

**RESPONSE UNDER 37 CFR §1.116  
EXPEDITED PROCEDURE  
TECHNOLOGY CENTER ART UNIT 1625**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Takanori SHIMIZU et al.

Group Art Unit: 1625

Application No.: 10/524,686

Examiner: T. SOLOLA

Filed: April 19, 2005

Docket No.: 122760

For: PROCESS FOR PRODUCING AMINOBENZOPYRAN COMPOUND

**REQUEST FOR RECONSIDERATION AFTER FINAL REJECTION**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

In reply to the August 13, 2008 Office Action, the period for response having been extended by the enclosed Petition for Extension of Time, reconsideration of the rejection and objections is respectfully requested in light of the following remarks.

**REMARKS**

Claims 1, 2, 4-5, 7 and 9 are pending in this application. The Office Action rejects claims 1-9 under 35 U.S.C. §103(a). Applicants respectfully traverse the rejection.

The courtesies extended to Applicants' representative by Examiner Solola at the interview held November 20, 2008, are appreciated. The reasons presented at the interview as warranting favorable action are incorporated into the remarks below and constitute Applicants' record of the interview.

**I. Rejection under 35 U.S.C. §103(a)**

Claims 1-9 are rejected under 35 U.S.C. §103(a) as having been obvious over Hiroko (JP 05-078289). Applicants respectfully traverse the rejection.

Applicants respectfully submit that the teachings of Hiroko would not have rendered obvious the presently claimed method because (1) the compounds of Hiroko are not analogous starting materials, and (2) the presently claimed invention provides highly unexpected results.

First, Applicants respectfully submit that the compounds taught by Hiroko, which include only benzene and naphthalene rings, are not analogous to the presently claimed formula (1), which contains a benzopyran ring. Under MPEP 2144.09(V), "the presumption of obviousness based on a reference disclosing structurally similar compounds may be overcome where there is evidence showing there is *no reasonable expectation of similar properties*" (emphasis added). Applicants respectfully submit that a person having ordinary skill in the art of chemistry would not have expected the benzopyran compound of formula (1) to have similar properties as the compounds taught by Hiroko. Generally, benzene's aromatic bonds are widely known in the art of chemistry to be stable, while the olefin (i.e. double) bond in the benzopyran compound is known to be much more reactive.

More specifically, benzopyran compounds such as formula (1) are widely known in the art as easily undergoing reduction at the olefin bond. See the present specification at, for example, paragraphs [0002], [0003] and [0046]. In particular, reduction of the olefin bond results in the production of undesirable by-product having formula (5). See the present specification at page 8. Thereby, a person having ordinary skill in the art *would have expected* that the olefin bond would undergo reduction during a method that reduces another group within the compound (i.e. the NO<sub>2</sub> group). In contrast, a person having ordinary skill in the art would *not* have expected the aromatic bonds in the compounds taught by Hiroko to undergo reduction in such a method, because aromatic bonds are known to be much more stable. Therefore, a person having ordinary skill in the art would have had *no reasonable expectation of similar properties* as between the presently claimed formula (1) and the compounds taught by Hiroko.

The Office Action alleges that "there is no evidence in the specification or the prior arts that any part of the starting reagents other than NO<sub>2</sub> is involved in the reaction process." Applicants do not necessarily disagree with this statement on its face. As is discussed throughout the present specification, *only* the NO<sub>2</sub> in the presently claimed compound of formula (1) undergoes reduction. The olefin bond does not undergo reduction. However, *this does not mean that the benzopryan compound is merely analogous to any compound that does not react under these conditions*. Instead, Applicants respectfully submit that the fact that the olefin bond in the benzopryan *does not undergo reduction* was highly unexpected, because various other methods involving benzopryan *do* cause the olefin bond to be reduced. In this way, *no reasonable expectation of similar properties* exists if a person having ordinary skill in the art would have expected the olefin bond to be reduced, even if in fact the present inventors discovered that (under certain conditions) the olefin bond is *not* reduced.

Furthermore, Applicants respectfully submit that the Office Action's reliance on *In re Durden*, 226 USPQ 359 (Fed. Cir. 1985) is misplaced. *In re Durden* decided the question of "whether a chemical process, otherwise obvious, is patentable *because* either or both the specific starting material employed and the product obtained are novel and unobvious," (emphasis in original). The Federal Circuit found that such a process is not patentable. However, the situation in *In re Durden* is entirely different from the presently claimed invention. In the presently claimed invention, there is *no* allegation that either the starting reagent or the ending product are novel or unobvious. Instead, Applicants respectfully submit that the presently claimed invention is unobvious because the starting materials are *not* analogous (based on their *expected* different reactivities), and a person having ordinary skill in the art would not have expected the chemical process to proceed in the manner as claimed. Therefore, this case is not applicable to the present situation or the presently claimed invention.

Additionally, Applicants respectfully submit that the presently claimed invention displays highly unexpected results. Under MPEP 2144.09(VII), "A *prima facie* case of obviousness based on structural similarity is rebuttable by proof that the claimed compounds possess unexpectedly advantageous or superior properties," although this section references "compounds," such a showing is clearly also applicable to method claims.

Specifically, the presently claimed method wherein platinum or palladium is used as a metal catalyst provides unexpected results of superior selectivity with respect to the olefin bond, such that by-product (5) is not formed. See the present specification at, for example, page 8, Table 1, and paragraph [0046]. Specifically, paragraph [0046] shows that reduction with  $\text{FeCl}_3$  results in much higher amounts of (5) as compared to the presently claimed invention. These results are unexpected over Hiroko *because Hiroko teaches that all of the catalysts taught therein are interchangeable*. Hiroko nowhere teaches or suggests that any

particular catalyst would achieve any different results, because the reactant compounds of Hiroko are very different (as discussed above) such that they would not undergo the reduction reaction to form a by-product such as formula (5) (i.e. because, again, the compounds taught by Hiroko do not contain olefin bonds). The unexpected results shown by the presently claimed invention are therefore neither applicable to Hiroko nor taught therein.

Accordingly, independent claim 1 would not have been obvious over Hiroko for at least the reasons discussed above. Dependent claims 2, 4-5, 7 and 9 therefore also would not have been obvious for at least the reason that independent claim 1 would not have been obvious.

Reconsideration and withdrawal of the rejection are respectfully requested.

## II. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



James A. Oliff  
Registration No. 27,075

Samuel T. Dangremond  
Registration No. 60,466

JAO:STD/std

Attachment:

Petition for Extension of Time

Date: December 15, 2008

**OLIFF & BERRIDGE, PLC**  
**P.O. Box 320850**  
**Alexandria, Virginia 22320-4850**  
**Telephone: (703) 836-6400**

DEPOSIT ACCOUNT USE  
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Please grant any extension  
necessary for entry;  
Charge any fee due to our  
Deposit Account No. 15-0461



**PATENT APPLICATION**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Takanori SHIMIZU et al.

Group Art Unit: 1625

Application No.: 10/524,686

Examiner: T. SOLOLA

Filed: April 19, 2005

Docket No.: 122760

For: PROCESS FOR PRODUCING AMINOBENZOPYRAN COMPOUND

**PRE-APPEAL BRIEF REQUEST FOR REVIEW**

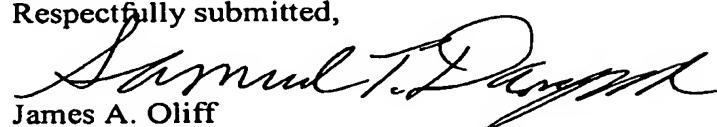
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

This request is being filed with a Notice of Appeal. Review of the August 13, 2008 Final Rejection is requested for the reasons set forth in the attached five or fewer sheets.

Should any questions arise regarding this submission, or the Review Panel believe that anything further would be desirable in order to place this application in even better condition for allowance, the Review Panel is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

  
James A. Oliff  
Registration No. 27,075

Samuel T. Dangremond  
Registration No. 60,466

JAO:STD/emd

01/14/2009 SHOHANNE 020000066-10524686

01-FC-1401

548.00-6P

Attachments:

Petition for Extension of Time  
Notice of Appeal

Date: January 13, 2009

**REMARKS**

Applicants respectfully request review of the Final Rejection mailed August 13, 2008, for at least the following reasons.

**I. Status of Pending Claims**

Claims 1, 2, 4, 5, 7, and 9 are pending in this application. The Office Action rejects claims 1-9 under 35 U.S.C. §103(a). Claims 3, 6 and 8 were cancelled by the Amendment After Final Rejection filed October 3, 2008. Entry of the amendments made in the Amendment After Final Rejection filed October 3, 2008 was confirmed by the Advisory Action mailed October 24, 2008.

Claims 1, 2, 4, 5, 7, and 9 remain rejected under 35 U.S.C. §103(a).

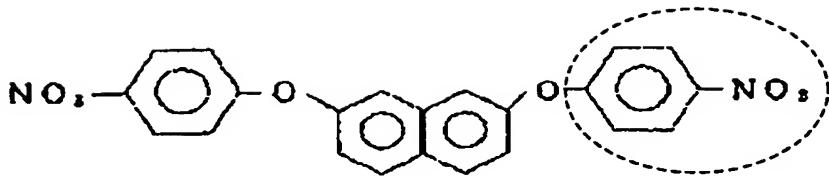
**II. Grounds of Rejection Presented for Review**

The Office Action rejects claims 1-9 under 35 U.S.C. §103(a) as having been obvious over Hiroko et al. ("Hiroko", JP 05-078289).

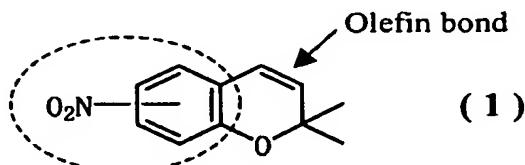
Applicants' traversal of the rejections and supporting arguments were made of record in the Amendment After Final Rejection filed October 3, 2008, and in the Request for Reconsideration After Final Rejection filed December 15, 2008. Applicants' respectfully request review of the rejections in light of the remarks made in the October 3 Amendment and the December 15 Request for Reconsideration, with particular emphasis on the following points:

Applicants respectfully submit that the teachings of Hiroko would not have rendered obvious the presently claimed method because (1) the compounds of Hiroko are not analogous starting materials, and (2) the presently claimed invention provides highly unexpected results.

The compounds of Hiroko are as shown below:



In contrast, the presently claimed invention includes compounds having the following formula:



The Office Action alleges that the compounds taught by Hiroko, in particular the circled portion of the compound shown above, is analogous to the presently claimed compound (1) shown above. The Office Action alleges that "there is no evidence in the specification or the prior arts that any part of the starting regents other than NO<sub>2</sub> is involved in the reaction process," and therefore assumes that the compounds are analogous. Applicants respectfully traverse this assumption.

Applicants respectfully submit that the *lack* of reaction at any site other than the NO<sub>2</sub> group *is itself* the discovery of the present inventors. Under MPEP 716.02(a),

Absence of property which a claimed invention would have been expected to possess based on the teachings of the prior art is evidence of unobviousness. *Ex parte Mead Johnson & Co.* 227 USPQ 78 (Bd. Pat. App. & Inter. 1985) (Based on prior art disclosures, claimed compounds would have been expected to possess beta-andrenergic blocking activity; the fact that claimed compounds did not possess such activity was an unexpected result sufficient to establish unobviousness within the meaning of 35 U.S.C. 103.).

As is discussed in the present specification at, for example, paragraphs [0002], [0003] and [0046], benzopyran compounds such as those of formula (1) are widely known in the art as easily undergoing reduction at the olefin bond (noted above). In particular, reduction of this olefin bond results in the production of undesirable by-product having formula (5), as shown in the present specification at page 8.

A person having ordinary skill in the art therefore *would have expected* that the olefin bond in formula (1) would undergo reduction during a reaction method, such as that taught by Hiroko, that reduces the NO<sub>2</sub> group. In contrast, a person having ordinary skill in the art would *not* have expected, prior to the claimed invention, the aromatic bonds in the compounds taught by Hiroko to undergo reduction in such a method, because aromatic bonds are known to be much more stable than olefin bonds. Therefore, a person having ordinary skill in the art would have had *no reasonable expectation of similar properties* as between the presently claimed compounds of formula (1) and the compounds taught by Hiroko, because Hiroko's compounds only include aromatic bonds and do not include any olefin bonds. The presently claimed compounds are therefore not analogous to the compounds taught by Hiroko.

In particular, the Office Action makes *no* showing that a person having ordinary skill in the art *would have known at the time of the invention* that no other part of the compound having formula (1) (other than NO<sub>2</sub>) is involved in the reaction process. Absent such a showing, the Office Action impermissibly uses the present inventors' own disclosure as evidence of the obviousness of the presently claimed invention.

Thus, the presently claimed invention displays highly unexpected results of avoiding reduction of the olefin bond, such that by-product (5) is not formed. See the present specification at, for example, page 8, Table 1, and paragraph [0046]. Specifically, paragraph

[0046] shows that reduction with  $\text{FeCl}_3$  results in much higher amounts of compound (5) as compared to the presently claimed invention. These results are unexpected over Hiroko because Hiroko teaches or at least strongly implies that all of the catalysts taught therein are interchangeable. Hiroko nowhere teaches or suggests that any particular catalyst would achieve any different results, because the reactant compounds of Hiroko are very different (as discussed above) such that they would not undergo the reduction reaction to form a by-product such as formula (5) (i.e. because, again, the compounds taught by Hiroko do not contain olefin bonds). The unexpected results shown by the presently claimed invention are therefore not taught by Hiroko, nor are they even applicable to the teachings of Hiroko.

### III. Conclusion

For at least the reasons discussed above and made of record, it is respectfully submitted that the Final Rejection is predicated upon legal and factual deficiencies, and that all the pending claims are in condition for allowance. Withdrawal of the Final Rejection and allowance of this application are respectfully requested.

Respectfully submitted,

  
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Registration No. 60,466

JAO:STD/emd

Date: January 13, 2009

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,686	04/19/2005	Takanori Shimizu	122760	8331
25944	7590	08/04/2009		
OLIFF & BERRIDGE, PLC			EXAMINER	
P.O. BOX 320850			SOLOLA, TAOFIQ A	
ALEXANDRIA, VA 22320-4850			ART UNIT	PAPER NUMBER
			1625	
				MAIL DATE
				08/04/2009
				DELIVERY MODE
				PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>
	10/524,686 Examiner Taofiq A. Solola	SHIMIZU ET AL. Art Unit 1625

— The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 04 June 2009.  
 2a) This action is **FINAL**.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 1,2,4,5,7 and 9 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-2, 4-5, 7, 9 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) Notice of References Cited (PTO-892)  
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)  
 3) Information Disclosure Statement(s) (PTO/SB/08)  
     Paper No(s)/Mail Date 6/4/09.

4) Interview Summary (PTO-413)  
     Paper No(s)/Mail Date. \_\_\_\_\_.  
 5) Notice of Informal Patent Application  
 6) Other: \_\_\_\_\_.

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Claims 1-2, 4-5, 7, 9 are pending in this application.

Claims 3, 6, 8 are deleted

***Request for Continued Examination***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.117(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/4/09 has been entered.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 4-5, 7, 9, are rejected under 35 U.S.C. 103(a) as being unpatentable over Hiroko et al., JP 5078289.

Applicant claims a process of making aminobenzopyran of formula 2, comprising reducing nitrobenzopyran of formula 1 with hydrazine in the presence of a metal catalyst. In preferred embodiments the catalyst is platinum or palladium and the molar equivalent of hydrazine to compound 1, is 2 to 5.

**Determination of the scope and content of the prior art (MPEP 2141.01)**

Hiroko et al., teach a process of making 4-amino phenoxy naphthalene by reducing 4-nitro phenoxy naphthalene with hydrazine in the presence of platinum or palladium catalyst and the molar equivalent of hydrazine to the nitro compound, is 1.2 to 2. See [0017].

Ascertainment of the difference between the prior art and the claims (MPEP 2141.02)

The difference between the instant invention and that of Hiroko et al., is that the starting materials are analogous compounds and therefore the products. Also the ratios of hydrazine to the starting reagents are different.

Finding of *prima facie* obviousness--rational and motivation (MPEP 2142.2413)

However, the use of analogous starting materials in a well-known process is *prima facie* obvious. *In re Durden*, 226 USPQ 359 (1985). There is no evidence in the specification or the prior arts that any part of the starting reagents other than NO<sub>2</sub> is involved in the reaction process. Changing the molar equivalent of hydrazine to the starting reagent is an obvious modification available to the preference of an artisan, and does not rise to the level of invention under the US patent practice. It is a mere optimization of a variable, which is not patentable absent unexpected result due to the variable, which is different in kind and not merely in degree from that of the prior art. *In re Aller*, 22 F.2d 454,105 USPG 233 (CCPA, 1955).

Therefore, the instant invention is *prima facie* obvious from the teaching of the prior art. One of ordinary skill in the art would have known to use analogous starting reagent, at the time the instant process was made. The motivation is from knowing that analogous starting reagents would have similar chemical reactions.

Alternatively, given the teaching of Hiroko et al., it would have been obvious to try reduction of any nitro compound with hydrazine in the presence of platinum or palladium catalyst at the time the invention was made.

When there is motivation

to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this

leads to anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under [35 USC] 103.

*KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct 1727,----, 82 USPQ2d 1385, 1397 (2007).

Alternatively, given the teaching of Hiroko et al., one would have known to reduce any nitro compound with hydrazine in the presence of platinum or palladium catalyst at the time the invention was made. "When a work is available in one field of endeavour, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, §103 likely bars its patentability. For the same reason if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technology is obvious unless its actual application is beyond his or her skill." "One of the ways in which a patent's subject matter can be proved obvious is by noting that there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims." *KSR Int. Co. v. Teleflex Inc*, 550 U.S. ----, 82 USPQ2d 1385 (2007).

Alternatively, applicant has done nothing more than substitutes analogous starting reagents in a well known process. However, such substitution is obvious from the prior art. "When a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result." *United States v. Adams*, 383 U.S. 49, 50-51 (1966). Cited in *KSR Int. Co. v. Teleflex Inc*, 550 U.S. ----, 82 USPQ2d 1385 (2007). The combination of familiar

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elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR, supra*.

This is RCE of the same application. All claims are drawn to the same invention claimed in the earlier application and have been finally rejected on the grounds and art of record. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action in this case. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no, however, event will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

#### ***Telephone Inquiry***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Taofiq A. Solola, PhD. JD., whose telephone number is (571) 272-0709.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Janet Andres, can be reached on (571) 272-0867. The fax phone number for this Group is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (571) 272-1600.

/Taofiq A. Solola/

Primary Examiner, Art Unit 1625

July 28, 2009

XIV.

**APPENDIX E - RELATED CASES APPENDIX**

NONE